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AUTHOR Wishart, Elizabeth; Smith, J. Lea
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ABSTRACT

Using a list of 15 logical connectives and a selected sample of 216 students from the higher range of ability in two British comprehensive schools, a study investigated the comprehension of those logical connectives in two contexts, "everyday" and "history." The 15 connectives tested occurred in a chapter of the textbook, "The Modern World Since 1870." The connectives tested included "consequently," "yet," "nevertheless," "moreover," "in fact," "so far," "above all," "from the start," "obviously," "if," "unlike," "furthermore," "such as," "actually," and "now." Fifteen short passages were taken, almost verbatim, from the chapter. Each of these contained one word from the list. From these passages two forms of test were prepared--a gap filling form and a sentence completion form. A regression analysis was carried out to examine the effects of age, context, test type, school, and sex on the ability to understand logical connectives. Results showed that the difference in the students' ability to understand the connectives in each of the two contexts was significant, but there was no significant difference by age, sex, or test type. Furthermore, there was no correlation between students' ability to understand connectives and their ability to use connectives in their writing. (HOD)

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# Pupils' Understanding of Logical Connectives in Selected texts in History

**Authors:** Mrs. Elizabeth Wishart, B.Sc., PGCE, M.Ed., Lecturer in Education, Faculty of Education, University of Warwick, Coventry, England.

J. Lea Smith, Ph.D., Assistant Professor, University of Pittsburgh, Johnstown, PA. U.S.A.

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## Abstract

The study presents a preliminary examination of the understanding of fifteen logical connectives in two contexts, everyday and history. Two forms of test were constructed in each of the two contexts and these were administered to 216 prospective 'O' level and C.S.E. pupils in two comprehensive schools. 54 responses were obtained to each form of the test. The Longman History Series from which the test items were developed formed part of the resource material used in these schools.

Counts were taken, using a comprehensive list of logical connectives, of their occurrence in samples of nine text books. A count of 18% was obtained. The difference in the pupils' ability to understand the connectives in each of the two contexts was significant, but there was no significant difference by age, gender, or test type. There was no correlation between pupils' ability to understand connectives and to use them in their writing.

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## Introduction

There is evidence of a growth of interest in language across the curriculum since the publication of the Bullock report (1975). There have been a number of publiciations on this theme since then, for example Marland (1977), however, seven years after the Bullock report it is still wrong to infer that the interest is widespread and there is still considerable work to be done in identifying the language registers of the disciplines of the curriculum and also in providing guidelines for teachers about how to develop their pupils' fluency in these registers.

The Schools Council project, (Lunzer and Gardner 1979) pointed to the minimal amount of reading which goes on in classrooms and it can be inferred from this and other outcomes of this project that there is little instruction by teachers in the understanding of the language employed by textbook writers. However, the Bullock committee did not offer the teachers the support which they might have expected with this problem since it gave final responsibility for language across the curriculum to English departments in secondary schools. The wisdom of this decision is doubtful because English departments have worked hard over the last two decades to establish themselves as literature specialists and many do not see their role as that of servicing the

language needs of the curriculum.

Mastery of the written word is central to independent study and to success in achieving the goals of education to which the examination system is principally attuned. This is perhaps nowhere more true than in the study of History. Yet, intuitively, teachers are aware that large numbers of their pupils are not readily able to read their text books effectively.

This general background led to the study of logical connectives in selected texts in history. Research studies (Edwards 1978, Gardner 1977, Perera 1979) indicate that non technical language poses a greater problem for understanding than technical language. Teachers recognise the need to teach the technical language of their disciplines but often make assumptions about pupils' competence in the specialised use of non technical words. Gardner's study examined the understanding of logical connectives in science. Logical connectives are words or phrases which link ideas together in a logical way. Consider the following paragraph from the best selling series of history textbooks.

> "In 1933 he* took Germany out of both the League of Nations and the disarmament talks at Geneva. Then in 1934 Austrian nazis

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> "In 1933 he* took Germany out of both the League of Nations and the disarmament talks at Geneva. Then in 1934 Austrian nazis

murdered their Chancellor, Englebert Dolfuss and tried to join their country to Germany. This Anschluss failed because Dolfuss's successor quickly restored order, and Mussolini moved his troops to the Austrian frontier. Obviously, Italy was against the German occupation of a country which included territories she claimed as Italian. Nevertheless, Hitler continued to attack the Versailles Treaty in his speeches and to disobey its terms".

* Hitler — The Modern World Since 1870, p.171. L.E. Snellgrove. Longman Secondary Histories 1968.

"Anschluss" is explained earlier in the text, the understanding of this word is not assumed. The logical connectives used in this one paragraph include examples of those signalling time (then); cause and effect (because); information adding to the argument (obviously); information changing the direction of the argument (nevertheless).

Gardner's study in Science concluded firstly that there was a development in the understanding of logical connectives over the age range 12 - 15 and secondly that the Science context was only slightly more difficult than that of ordinary everyday usage. He carried out his study using a list of 200 connectives and he tested these on the whole secondary school population of Victoria Australia some 16.000 pupils. The present study draws on some of Gardner's test material and comparisons will be made with his results.

Method of the Study

The study presents a preliminary investigation using a short list of fifteen logical connectives and a selected sample of 216 prospective 'O' level or 'C.S.E.' candidates, that is, pupils from the higher range of ability, in the third, fourth and fifth years of two comprehensive schools. These two schools were simply schools which expressed their willingness to co-operate. However, they taught different syllabuses leading in the one case to the Schools Council History 13 - 16 examination with its emphasis on the importance of skill teaching to conceptual development in history. In the other to an examination by formal essay papers only. The samples in each school were comparable in terms of age, ability, numbers and gender (71% girls 29% boys). It became possible therefore to make a comparison between schools and a tentative comment on the understanding of connectives by two groups of pupils exposed to different emphases in the syllabuses they were following.

The fifteen logical connectives tested occurred in Chapter 17 of the textbook, The Modern World Since 1870 (Snellgrove 1968). The chapter discusses the causes of the second world war. The investigation was carried out in Coventry with its Cathedral monument to the devastation of war and the subsequent reconstruction;

where it was assumed that the topic might be familiar in a limited way to the majority of pupils of 13+ years. The connectives tested were : consequently; yet; nevertheless; moreover; in fact; so far; above all; from the start; obviously; if; unlike; furthermore; such as; actually; now.

Fifteen short passages were taken, almost verbatim, from the chapter. Each of these contained one word from the list. From these passages two forms of test were prepared. These were gap filling and sentence completion forms. The gap filling form was made up of fifteen items in which the pupil selected the appropriate connective from alternatives provided to fill a gap. In the sentence completion form of test the pupil selected the appropriate statement to follow a given connective by choosing again from among the alternatives provided. Examples of these items are :

Gap Filling 0.4.

Since Hitler's earliest days one of his political aims had been to enlarge Germany and include all Germans inside the Reich. This was against the terms of the Versailles Treaty. It conflicted with the French policy of keeping Germany small and surrounded by countries friendly to France. ....., it seemed to many only fair because Austria was almost entirely German and Czechoslovakia had a large German population.

(a) Above all (b) Therefore (c) Nevertheless
(d) Unless (e) Also

**Sentence Completion**

Since Hitler's earliest days one of his political aims had been to enlarge Germany and include all Germans inside the Reich. This was against the terms of the Versailles Treaty. It conflicted with the French policy of keeping Germany small and surrounded by countries friendly to France. Nevertheless,

(a) Hitler was ruthless with his foreign enemies;

(b) it seemed fair because Austria was almost entirely German and Czechoslovakia had a large German population;

(c) the Versailles Treaty was signed on 28th June 1919;

(d) Austria and Czechoslovakia were friendly countries bordering Germany.

Alongside these two forms of history test, two forms of test were constructed using the same connectives in ar everyday context. The items for these were taken from Gardner's study. Examples of these are :

**Gap Filling**

The book said that the oil in the car engine needed changing after every 10,000 kilometers. ....., John decided to change the oil after every 5,000 kilometers.

(a) Accordingly (b) Therefore (c) Nevertheless

(d) Hence (e) Also

**Sentence Completion**

The book said that the oil in the car engine needed changing after every 10,000 kilometers. Nevertheless,

(a) it is a good idea to follow these instructions very carefully;

(b) the oil in the car engine has been changed to prevent the parts from wearing out;

(c) John decided to change the oil after every 5,000 kilometers;

(d) the fluid in the brake system should be checked every 10,000 kilometers.

The population (N = 216) comprised three class groups (N = 36) in each of the third, fourth and fifth years, in each of the two schools. The tests were randomised and each pupil completed one test. Nine responses to each test form were obtained in each school.

Table 1 about here

Treatment of the Data and Discussion

A regression analysis was carried out to examine the effects of age, context, test type, school and gender on the ability to understand logical connectives.

No significant difference was found between the age groups overall nor in the everyday and history contexts separately.

Table 2 about here

Figure 1 about here

The level of understanding in the everyday context is high (mean item facility 83% i.e. mean percentage of right answers). The sample was selected by ability and it might therefore be argued that these pupils had achieved fluency with the use of these connectives by the age of 13+ years. However, this fluency is not manifest with history texts at that age, nor is there

| Context | Everyday | | History | | Total |
|---|---|---|---|---|---|
| Test Form | GF | SC | GF | SC | |
| Sch 1 Year 3 | 9 | 9 | 9 | 9 | 36 |
| Year 4 | 9 | 9 | 9 | 9 | 36 |
| Year 5 | 9 | 9 | 9 | 9 | 36 |
| Sch 2 Year 3 | 9 | 9 | 9 | 9 | 36 |
| Year 4 | 9 | 9 | 9 | 9 | 36 |
| Year 5 | 9 | 9 | 9 | 9 | 36 |
| Total | 54 | 54 | 54 | 54 | 216 |

Table 1. Organisation of Sample

| Year Group | Year 3 | | Year 4 | | Year 5 | |
|---|---|---|---|---|---|---|
| Context | mean | s.d. | mean | s.d. | mean | s.d. |
| Overall | 10·42 | 2·80 | 10·69 | 2·38 | 11·09 | 2·37 |
| Everyday | 12·92 | 2·22 | 13·44 | 1·98 | 13·72 | 1·72 |
| History | 7·92 | 3·18 | 7·94 | 2·69 | 8·47 | 3·03 |

Table 2. Table of means by age in two contexts

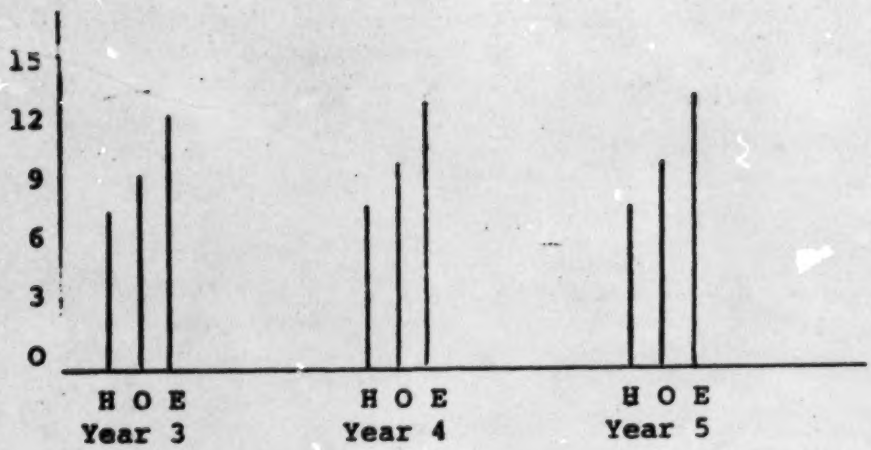


Fig. 1. Diagrammatic representation of means by age in two contexts

any improvement in the succeeding two years. Gardner found a development in understanding with age, his sample used the whole ability range, not a selected group of higher ability pupils and this might explain the differences in the outcomes of the two studies.

The history context is significantly harder than the everyday context at each age ($T = 4 \cdot 56 p > \cdot 001$). This result is contrary to that of Gardner in his study of Science items. Gardner (1977) p.76 states:

> "the use of scientific language adds to item difficulty but not to a very great extent".

This difference might be attributed to the fact that the history items were presented in the formal language of the text book whereas Gardner's science items were constructed for the purposes of the test by his students and might bear more resemblance to the language of speech and to the everyday items than to the formal language of written text.

An examination of the corresponding item facilities for the everyday items shows a higher mean for the Coventry group, 83%, than for the Australian group, 65%, consistent with the English group being a biased sample selected from the examination classes, yet the history mean item facility, 53%, is marginally lower than Gardner's Australian mean item facility in Science, 54·6%. Bearing

in mind that the subjects for the history study were selected higher ability groups this appears to indicate a high level of difficulty for the history items. The nature and extent of this difficulty will be discussed later.

The test forms, gap filling and sentence completion did not produce significantly different results. There was no significant difference associated with gender but it must be remembered that the sample was 71% girls and 29% boys, hardly an appropriate balance for comparison.

Examination of the population of the two schools separately showed no significant difference. Therefore, in the case of these two schools, preparation for the two different examinations with two different declared emphases in the syllabuses produced no difference in performance in the understanding of logical connectives in the history items.

Table 3 about here

Figure 2 about here

Gardner and his students compiled a comprehensive list of 200 connectives used in science text books. Of these he designated 70 more difficult than the other 130. The 15 items tested in this study contained 9 of these. The list might therefore be viewed as more difficult than average.

| School | School 1 | | School 2 | |
|---|---|---|---|---|
| Context | mean | s.d. | mean | s.d. |
| Everyday | 13·04 | 2·25 | 13·69 | 1·66 |
| History | 8·02 | 3·18 | 8·20 | 2·74 |

Table 3. Table of means by school in two contexts

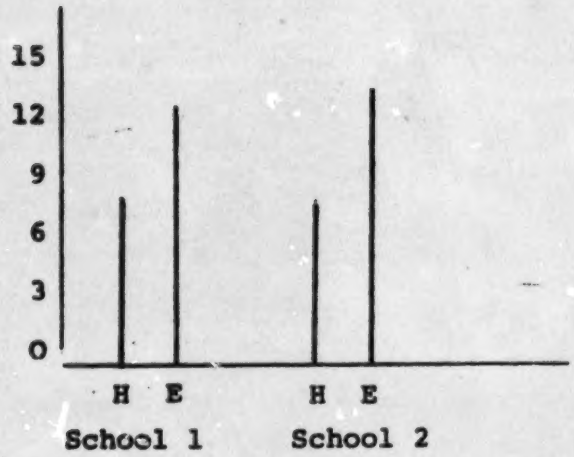


Fig. 2. Diagrammatic representation of m[illegible] by school in two contexts

History text books were examined for the use of logical connectives using Gardner's comprehensive list as the criterion. The extent of the use of logical connectives was measured as a percentage of the total number of words using 10 single page samples evenly spaced through each book. The chapter from which the history items were selected was compared with the rest of the book to which it belonged. Comparisons were made between this book and two other books in the same series and between this series and two other series, the Penguin series and the Schools Council 13 - 16 material. Counts of connectives taken in each of these nine books revealed a consistent average of about 5% of the print on the pages counted. Intuitively this seems to be a figure large enough to merit some attention.

The processes of cause, comparison, sequence and inference are examples of the processes of the study of history which are signalled by connectives. Once the study of history moves beyond the descriptive to making historical judgments, the processes involved will be signalled by these words and so it is perhaps to be expected that they will form a significant proportion of the written text.

The history context is clearly more abstract and further removed from the pupils' experience than the everyday context and so it is important to establish that the

logical connectives do contribute to the item difficulty above and beyond the conceptual content, that is that the ease or difficulty of the connectives should show a positive correlation in both contexts even though the level of difficulty might be greater in one context than the other. Gardner established positive correlations in his study and table 4 shows a comparison between new correlations obtained using Gardner's data for the fifteen connectives tested here and correlations using the history data. The narrow ability band and the small size of the sample make correlations difficult to achieve compared with Gardner's study and so the figures obtained here show that a substantial contribution to item facility or difficulty may be associated with the use of the particular connectives. ($p > .01$)

Table 4 about here

Gardner's study also suggests that the more commonly used connectives are more easily understood. It might be possible to infer that exposure aids understanding and then to suggest that although the connectives tested here include a high proportion of difficult examples increased exposure to them might encourage their understanding.

When the opening paragraphs of pupils' written work was

| Test Form | Everyday/Science | Everyday/History |
|---|---|---|
| G.F. | r = ·362 | r = ·236 |
| S.C. | r = ·605 | r = ·326 |

Table 4. A comparison between the correlations of item facilities

examined for their use of connectives, no correlation was found between their ability to use connectives and their understanding of them in print, that is, the pupils do not transfer the language patterns which they read to their writing in history.

Conclusion

The inability of pupils to understand and to use logical connectives in the context of history by comparison with the everyday context and the apparent lack of improvement over the period during which they are preparing for public examinations perhaps indicates that teachers are making inappropriate assumptions that these abilities will develop in a general context and that they will be transferred.

Many pupils who took part in this study will be successful in their turn in their public examinations. This much can be predicted with confidence on the basis of the records of the schools. However, most pupils will have had their last regular encounters with expert historians when they leave the fifth form and it is therefore incumbent on teachers to prepare their pupils by the end of the 'O' level year for independent learning and independent use of written material in history if their time spent on history in school is to influence their ability to make judgments later on.

It is not possible to avoid written language in the effective study of history. Logical connectives are one element only in the written language of history but one which is important and which does give rise to difficulty for pupils' independent work. Their use by pupils might be encouraged by exposure. A study of the classroom language of history teachers would provide some evidence about the present degree of aural exposure. Additionally a preliminary study of teaching through a text, after the manner of the Nottingham Reading for Learning project but with special attention to language cues and in particular, connectives might provide some evidence of the benefits or otherwise of this approach.

It has already been suggested that the science items in Gardner's study might resemble speech rather than text book forms of written language. A new study using items comparable in origin to the history items might provide some enlightenment as to the extent to which the differences in the outcomes of the two studies relate to language forms and to the nature of the concepts they are used to explain. Experienced teachers are familiar with pupils grasping difficult ideas when they are presented in simple language and this strengthens the belief, albeit only a belief, that the difference in the findings of these studies are a consequence more of language than of differences in the nature of the concepts dealt with in

history and in science.

Even in the situation where the importance of thinking and reading skills to conceptual development are deliberately emphasised as in the Schools Council 13 - 16 material, the language which cues these skills does not appear, in this study, to have received special attention. The Schools Council History projects are a response to the need which history teachers recognise for their pupils to pursue the justification of historical argument but until the pupils understand the import of the language used to express the arguments they are unlikely to be able to decide whether the logic expressed has any validity. In other words, the pupils need not only to use the connectives to understand what the author is saying but also to question the relationships which he is proposing. Alongside the teaching of the skills and concepts then, there is a case for teaching the language of history.

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Perera K. (1979) The Language Demands of School Learning. Block 6 Language Development. Open University, Milton Keynes, England.


## Text books


Longman Secondary History Series 1968

| | |
|---|---|
| The Early Modern Age. | L.E. Snellgrove. |
| Britain Since 1700. | R.J. Cootes. |
| The Modern World Since 1870. | L.E. Snellgrove. |

Schools Council History 13-16 Project 1977

| | |
|---|---|
| The Arab-Israeli Conflict. ) | |
| Elizabethan England. ) | Project team. |
| Britain 1815-1851. ) | |

Penguin Education A History of Britain 1967

| | |
|---|---|
| Out of the Ancient World | V. Skipp |
| Medieval and Tudor Britain | V.E. Chancellor |
| The Making of a Nation 1603-1789 | A.J. Patrick |